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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE APPLICATION OF:	Peter MILLS, et al.	ART UNIT:	1794
SERIAL NO.:	10/519,994	EXAMINER:	Kevin R. KRUER
CONFIRMATION NO.:	5120		
FILING DATE:	September 07, 2005		
FOR:	POLYMERIC FILM		

**DECLARATION UNDER RULE 1.132**

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SIR:

I, Michael Taylor, do hereby declare as follows:

I am the third-named inventor of the above-identified patent application. I hold a BSc. (Hons), a MSc. and a PhD in the field of Polymer Science and Technology. I have 18 years of research experience in the production of polyolefin films and have 3 publications and 1 patent in this field.

This present claimed invention is related to a polyolefin single or multi-layer film, comprising at least one core layer comprising: (a) a polypropylenic (PP) component; and (b) a polyethylenic (PE) component or a polystyrenic (PS) component, wherein the dynamic loss modulus ( $E''$ ) of the film measured at 3 Hz and 25°C is from about 28 MPa to about 136 MPa in the transverse direction (TD) and/or from about 73 MPa to about 135 MPa in the machine direction (MD), wherein the dynamic storage modulus ( $E'$ ) of the film measured at 3 Hz and 25°C is from about 630 MPa to about 2800 MPa in the TD and/or from about 1300 MPa to about 3000 MPa in the MD, and wherein said film is biaxially oriented.

I have reviewed the Office Actions dated October 8, 2008 and May 27, 2009, and WO99/62987 to Taniguchi (hereinafter "Taniguchi").

A person of ordinary skill in the art would understand that dynamic modulus (i.e.,  $E'$  and  $E''$ ) can be expressed in the unit of  $\text{dyn/cm}^2$ , pascal or megapascal (MPa). The conversion between  $\text{dyn/cm}^2$  and MPa is:  $1 \times 10^7 \text{ dyn/cm}^2 = 1 \text{ MPa}$ . Therefore, the packaging film of Taniguchi has an  $E'$  of 50-500 MPa, which is lower than the claimed ranges of 630-2800 MPa in the TD and/or 1300-3000 MPa in the MD.

It would also be understood by a person of ordinary skill in the art that the storage modulus ( $E'$ ) of a semi-crystalline polymeric film, such as that produced from polypropylene, is sensitive to both the temperature and frequency (also known as strain rate) of measurement. Indeed, both effects of temperature and frequency are intrinsically linked, in that the polymer modulus reduces with increasing temperature and/or decreasing frequency of the applied strain. These relationships are well-documented in the open literature<sup>[1-7]</sup> and some examples specific to polyolefin materials are exhibited in appendices A and B.

Relating these fundamental principles of viscoelastic behaviour to the claims of the present invention and those of Taniguchi:

Although the  $E'$  value of Taniguchi's film was measured under conditions (10 Hz and 20°C) that are slightly different from the measuring conditions used in the instant application (3 Hz and 25°C), the value of  $E'$  generally decreases when measured at increasing temperatures. As shown in Table 1 of Taniguchi, the  $E'$  value measured at 20 °C is lower than the  $E'$  value measured at 0°C for the same film. Similarly, the  $E'$  value measured at 25 °C would be lower than the  $E'$  value measured at 20 °C. In addition, should the Taniguchi films' modulus be measured at the lower frequency of 3 Hz, this also would result in a lower measured modulus.

Accordingly, it is my opinion that the  $E'$  values of Taniguchi's films, when measured at 3Hz and 25°C, would be in a range that is lower than the  $E'$  range measured at 10Hz and 20°C. In other words, if Taniguchi's films have a maximum  $E'$  of 500 MPa, when measured at 10Hz and 20°C, the same films would have a maximum  $E'$  of less than 500 MPa, when measured at 3Hz and

25°C. Therefore, Taniguchi does not disclose a polyolefin film with an E' of about 630-2800 MPa in the TD and/or about 1300-3000 MPa in the MD.

I declare that all statements made herein based on my own knowledge are true, and that all statements made herein are based on information that is believed to be true. I further declare that these statements are made with the knowledge that willful false statements are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that willful false statements may jeopardize the validity of the above-referenced patent application and any patent that issues therefrom.

Date: 12/08/09	By: <u>H. Taylor</u> (Name) DR. MICHAEL TAYLOR
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#### References

- 1 Takayanagi, M., Mem. Fac. Eng. Kyushu Univ., 23, N° 1, p. 41. *reproduced in part in Ferry, J.D., Viscoelastic Properties of Polymers, 3<sup>rd</sup> ed., Wiley, (1980).*
- 2 Takayanagi, M., Pure Appl. Chem., 15, 555, (1967).
- 3 Becker, G.W., Kolloid-Z, 175, 99, (1961).
- 4 Ferry, J.D., Viscoelastic Properties of Polymers, 3<sup>rd</sup> ed., p.42, Wiley, (1980).
- 5 Maxwell, B., J. Polym. Sci.: part C, N° 9, p.52, (1965).
- 6 Heijboer, J., Br. Polym. J., 1, 3, (1967). *reproduced in part in Obewele, R.O., Polymer Science and Technology, Chapman and Hall, (2000).*
- 7 Takayanagi, M., Imada, K., Kajiyama, T., J. Polym. Sci., C15, 263, (1966)

## Appendix A

SBC, F

481

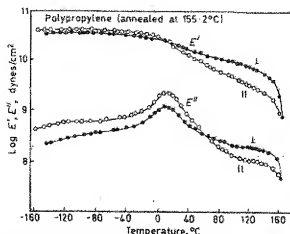


Fig. 16-23. Storage and loss tensile moduli at 110 Hz plotted against temperature, parallel and perpendicular to the draw direction, for polypropylene drawn eightfold at 30°C and subsequently annealed at 155°C. (Takayanagi.<sup>112</sup>)

concerning molecular mechanisms corresponding to responses at very high frequencies.<sup>114</sup>

Effects of orientation are observed in various other physical properties,<sup>115</sup> and can aid in identification and interpretation of the time-dependent mechanical

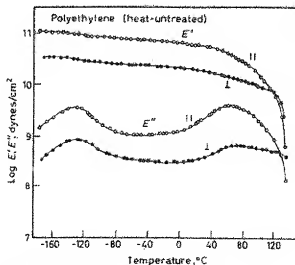


Fig. 16-24. Storage and loss tensile moduli at 110 Hz plotted against temperature, parallel and

Figure 16-23 above: Dynamic storage modulus  $E'$  is shown to decrease with increasing temperature. Data reported by: Takayanagi, M., Mem. Fac. Eng. Kyushu Univ., 23, N<sup>o</sup> 1, p. 41. taken from Ferry, J.D., *Viscoelastic Properties of Polymers*, 3<sup>rd</sup> ed., Wiley, (1980).

## Appendix B

52

B. MAXWELL

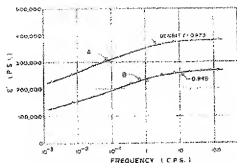


Fig. 13. Dynamic in-phase modulus of linear polyethylene as affected by pressure-induced crystallization.

bulk modulus until some specific pressure, approximately 6000 psi, is reached whereupon the material appears to yield in bulk compression and a high degree of increase in density is achieved with a relatively small increase in pressure. The pressure at which the material deviates from a high bulk modulus, or yields, increases as we increase the temperature. This illustrates that as we increase pressure at elevated temperature we can reach a situation where the pressure itself has induced crystallization in the polymer well above the normal atmospheric melting temperature. In other words we must be concerned with pressure-induced crystallization. If we can induce crystallization at elevated temperature, it then gives us the opportunity for changing morphology. One would expect that pressure as a nucleating agent would act homogeneously. This then opens the possibility for homogeneous nucleation and hence, the control of morphology and properties. Figure 12 illustrates this point. Here we have pictures of the spherulitic morphology of a sample of isotactic polypropylene exposed to two different pressure histories. For low pressure and a given thermal cycle we get large, well-developed spherulites. For high pressure and the same thermal cycle we get small, less well-formed spherulites together with some large ones which are apparently thermally nucleated. It may be concluded that we have the ability to control morphology in polymers by pressure-induced nucleation. Via pressure we have the same control over structure as the metallurgist has over grain size via control of temperature.

Figure 13 illustrates the significance of pressure-induced crystallization on mechanical behavior. Here we have the dynamic mechanical properties as a function of frequency for linear polyethylene at 30°C. By varying the pressure and therefore the temperature at which nucleation and crystallization takes place, we can obtain a range of densities from 0.945 up to 0.973. This means that without any change in chemical structures we

Figure 13 above: Dynamic storage modulus  $E'$  is shown to increase with increasing frequency (frequency here is measured as cycles per second – C.P.S.) taken from Maxwell, B., *J. Polym. Sci.: part C*, No 9, p.52, (1965).